

# PATENT COOPERATION TREATY

## PCT


### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 31 MAY 2005

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Applicant's or agent's file reference <b>53.91.81542/01</b>	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. <b>PCT/EP2004/007935</b>	International filing date (day/month/year) <b>15.07.2004</b>	Priority date (day/month/year) <b>17.07.2003</b>	
International Patent Classification (IPC) or national classification and IPC <b>G01N1/22, G01N1/00</b>			
Applicant <b>ECAMETER LTD. et al.</b>			
1. This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 5 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 6 sheets, as follows: <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).			
4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I      Basis of the opinion <input type="checkbox"/> Box No. II     Priority <input type="checkbox"/> Box No. III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV    Lack of unity of invention <input checked="" type="checkbox"/> Box No. V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI    Certain documents cited <input type="checkbox"/> Box No. VII   Certain defects in the international application <input type="checkbox"/> Box No. VIII  Certain observations on the international application			
Date of submission of the demand  <b>17.02.2005</b>		Date of completion of this report  <b>27.05.2005</b>	
Name and mailing address of the International preliminary examining authority:   <b>European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465</b>		Authorized Officer  <b>Timonen, T</b>  Telephone No. +49 89 2399-5666	



# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/EP2004/007935

## Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

### Description, Pages

1-5, 7, 10-31	as originally filed
8, 9	received on 17.02.2005 with letter of 17.02.2005
6	received on 10.05.2005 with letter of 10.05.2005

### Claims, Numbers

1-21	received on 10.05.2005 with letter of 10.05.2005
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### Drawings, Sheets

1/4-4/4	as originally filed
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- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/007935

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-21
	No: Claims	
Inventive step (IS)	Yes: Claims	1-21
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-21
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**RE Item V**

1. Reference is made to the following documents:

D1: WO 01/90741 A (UNITED KINGDOM GOVERNMENT ; AINSLIE BRUCE (CA);  
HENDREN FREDRICK (CA)) 29 November 2001 (2001-11-29)  
D2: US-A-5 615 247 (MILLS THOMAS O) 25 March 1997 (1997-03-25)  
D3: US-A-5 531 130 (WELKER BRIAN H) 2 July 1996 (1996-07-02)  
D4: WO 01/46689 A (PROPULSION CONTROLS ENGINEERIN) 28 June 2001  
(2001-06-28)

2. Document D1 which is considered as the closest prior art with respect to the subject-matter of claim 1 discloses a system for measuring emissions comprising means for obtaining a sample flow which is a controlled proportion of the total emissions to be measured, see Figure 2 and page 3, line 25 - page 4, line 11; and means for accumulating the sample flow in a housing (90,92,94) containing chemical reagents with which the accumulated samples react to provide a measure of a selected component in the sample, see Figure 2 and page 8, line 21 - page 9, line 3.

The subject-matter of claim 1 differs from that disclosed in the closest prior art in defining that the housing is tamper-proof and in that the apparatus comprises means for detecting the location of the apparatus and further in that the apparatus comprises switching means for directing the sample to one or other of the accumulation means according to the geographical location and/or time of the year and means for switching the accumulation means on and off according to the geographical location and/or at selected times.

Accordingly, the subject-matter of claim 1 is new in the sense of Article 33(2) PCT.

3. The technical problem addressed by the above-mentioned differences is to provide a way of getting uncompromised samples for checking whether regulations have been abided by and to make the apparatus adaptive to different commercial and legislative

issues rising in (eg. maritime) emission control.

All of the above mentioned differences as such are known in the available prior art or merely conventional modifications well known in the art. Documents D2 and D3 disclose the use of tamper-proof housing, see document D2, column 2, lines 12-48; and D3, column 5, lines 13-26. Furthermore, document D4 discloses means for detecting the location of an emission control apparatus, see page 2, line 32- page 3, line 4. Accordingly, the person skilled in the art would be aware of these possibilities.

Furthermore, the technical problem of ensuring that the samples remain uncompromised is known from the prior art, see eg. documents D2 and D3. However, there is no indication in the available prior art which would suggest the combination of all these features. Neither is there any reference to the technical problem of adapting the apparatus to different legislative and commercial requirements in different geographical locations or different times of the year.

Hence, the person skilled in the art could not end up with the subject-matter of claim 1 merely by following the combined teaching of the available prior art. Accordingly, the subject-matter of claim 1 would appear to contain an inventive step in the sense of Article 33(3) PCT.

Claims 2-21 are dependent on claim 1 and therefore also fulfill the requirements of the EPC with respect to novelty and inventive step.

4. Furthermore, the subject-matter of claims 1-21 is industrially applicable.

5 The emissions metering device of the present invention provides an accurate and reliable means for measuring emissions, which allows a more realistic and efficient regulation of emissions and may also be used to facilitate emissions trading to meet emissions restrictions. The emissions may then be automatically recorded, using a secure system, thus rendering reliance on the skills and trust of on-board personnel unnecessary. The device itself is secure to prevent any unauthorised access and tampering. Furthermore, the records of emissions may be logged externally, giving a secure and auditable account of the emissions of any ship etc. using the device, without the need for reliance on on-board record keeping.

10 In accordance with one aspect, the invention provides an apparatus for measuring emissions comprising: means for obtaining a sample flow, the sample flow being a controlled proportion of the total emissions to be measured; means for accumulating said sample flow in a housing, said housing containing one or more known chemical reagents with which the accumulated samples react to provide a measure of one or more selected components within said sample, said means for accumulating comprising a plurality of separate accumulation devices, each containing at least one respective chemical reagent, characterized in that said housing is tamper-proof, and in that the apparatus further comprises means for detecting the location of the apparatus; and switching means adapted to direct the sample to one or other of said accumulation devices according to geographical location and/or time of year or adapted to switch the accumulating means on or off depending upon location and/or at selected times.

15 It may be that several different components of the emission are to be measured, e. g. sulphur oxides and nitrogen oxides, in the case of gas emissions. In this case, different reagents will be used to detect the different components.

20 In an alternative embodiment, a separate tamper-proof housing can be provided for each type of reagent.

Depending on the component to be measured, the sample may first be passed through a cleaning chemical or some other cleaning arrangement to remove components which might otherwise interfere with the accumulation of the component to be measured. By appropriate selection of chemicals and the sequence of the flow through them, a wide variety of components can be accumulated and measured.



Whilst it is, of course, highly desirable that the emissions samples conveyed to the measuring equipment are a known proportion of the total emissions, there may be applications in which this is less important.

5 According to a preferred aspect, the invention provides a tamper-proof container having an inlet port adapted to receive emissions containing components to be measured, the inlet port is adapted to be sealed when the container is disconnected for receiving emissions.

10 The container is preferably adapted to be connected to an external device and to communicate with said device to provide information about the emissions measurements.

15 The interface between the container and the means for obtaining the sample must be such that it is sealed and secure. The same also applies to the interface between the container and an external device as mentioned above.

In many applications, it is essential that a secure processing chain exists between the taking of the samples, the measurement of the emissions and the analysis and recordal of such measurements.

20 Thus, according to a further preferred aspect of the invention, there is provided secure measurement and recordal of emissions means where the chemical reagents react with said sample and provide an indication of the quantity of selected components contained in the sample; the secure and the tamper-proof housing is removable under authorised conditions only and transportable and adapted to be connected to an external device under authorised  
25 conditions only. The removable device is preferably provided with encrypted identification means, particularly where the external device is in, for example, a laboratory, where emissions from various different sources are to be measured.

According to a further preferred aspect of the invention, a tamper-proof housing is provided with means for locking the housing, and means for unlocking the housing by means of a signal from a mobile telephone.

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Preferred embodiments will now be described, by way of example only, with reference to the drawings.

Figure 1 shows a block diagram of an emissions measuring system in accordance with the present invention.

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Figure 2 illustrates one embodiment of a sample flow control device.

Figure 3 illustrates an alternative sample flow control device.

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Figure 4 illustrates another alternative sample flow control device.

A wide range of emissions are potentially measurable by the emissions meter of the present invention. The emission meter of the present invention will be described mainly in relation to exhaust emissions, i. e. fuel emissions to the atmosphere as a result of combustion. However, the present invention is also applicable to other forms of emissions and these will also be described. In practice, sulphur oxides and nitrogen oxides are the exhaust emissions of greatest interest and the following will be explained with reference to, but not limited to, sulphur emissions.

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The emissions metering device 1 of the present invention will be described in the context of measuring emissions exhausted from a ship, boat or other sea vessel. However, the invention may also be used in conjunction with other mobile exhaust gas emitters, or even stationary ones, where a measure of the amount of emissions is required, as explained in relation to an aircraft below.

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The emissions metering device 1 of the present invention takes a controlled sample of a representative proportion of the exhaust gases or other form of emissions discharge and directs the sample to an appropriate emissions measuring device 2 where emissions react with



# Claims

1. An apparatus for measuring emissions comprising:  
means for obtaining a sample flow (9), the sample flow being a controlled proportion of the total emissions to be measured;  
5 means for accumulating said sample flow in a housing, said housing containing one or more known chemical reagents with which the accumulated samples react to provide a measure of one or more selected components within said sample, said means for accumulating comprising a plurality of separate accumulation devices, each containing at least one respective chemical reagent, characterized in that said housing is tamper-proof, and  
10 in that the apparatus further comprises means (41) for detecting the location of the apparatus; and switching means (31) adapted to direct the sample to one or other of said accumulation devices according to geographical location and/or time of year or adapted to switch the accumulating means on or off depending upon location and/or at selected times.
- 15 2. The apparatus of claim 1, further comprising:  
a cleaning chemical or cleaning arrangement to remove components which might otherwise interfere with the accumulation of the component to be measured.
- 20 3. The apparatus of any preceding claim, further comprising:  
an automatic time determining system which is set to switch the device on and off at selected times.
4. The apparatus of any preceding claim, wherein  
said means for obtaining the sample flow is adapted to take extracts from the exhaust  
25 ducts (3) of several engines and then to mix them, in proportion to the flow from each exhaust duct, and then pass the combined sample to the means for accumulating.
5. The apparatus of any preceding claim, further comprising:  
display means (33) for providing a visual indication of said measure.  
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6. The apparatus of any preceding claim wherein  
said tamper-proof housing is a tamper-proof removable canister.

7. The apparatus of claim 6, wherein:  
said canister is locked inside a tamper-proof cabinet (2).
8. The apparatus of claim 7 wherein said tamper-proof cabinet is adapted to be unlocked  
5 by a signal from a wireless communication means.
9. The apparatus of claim 8 wherein said tamper-proof cabinet is adapted to be unlocked  
by a signal from a mobile telephone.
- 10 10. The apparatus of any preceding claim, wherein  
the apparatus is provided with its own power supply (43).
11. The apparatus of claim 10 wherein said power supply is a battery.
- 15 12. The apparatus of any preceding claim, wherein:  
said tamper-proof housing has an inlet port (37) adapted to receive the sample flow of  
emissions containing components to be measured,  
wherein the inlet port is adapted to be sealed when said container is disconnected  
from receiving emissions.
- 20 13. The apparatus of any preceding claim wherein  
said housing is adapted to be connected to an external device (48) and to  
communicate with said external device to provide information about the emission measures.
- 25 14. The apparatus of claim 13 wherein said housing communicates with said external  
device by mobile telephone communication.
15. The apparatus of claim 14 where said communication is encrypted.
- 30 16. The apparatus of any preceding claim wherein  
an interface between the housing and the means for obtaining the sample is sealed and  
secure.
17. The apparatus of any preceding claim wherein

an interface between the housing and said external device is sealed and secure.

18. The apparatus of claim 13, 14 or 15, wherein  
said chemical reagents are adapted to react with said samples and provide an  
5 indication of the quantity of selected components contained in the sample.
19. The apparatus of any preceding claim, wherein the tamper-proof housing is removable  
under authorised conditions only and transportable and adapted to be connected to an external  
device (48) under authorised conditions only.
- 10 20. The system of claim 19 wherein  
the removable device is provided with encrypted identification means.
21. The apparatus of any preceding claim, wherein the tamper-proof housing is provided  
15 with means for locking the housing, and means for unlocking the housing by means of a  
signal from a mobile telephone.